Space Weather Forecast

Issued on Thursday, 10 March 2022 at 13:07 Local

This forecast provides a four-day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

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Space Weather Forecast Headline: Chance of Minor Geomagnetic Storm G1 to end current working week and again late in the weekend (UTC). Daily Chance of R1 Minor Radio Blackouts.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar activity was low over the period, with a solitary marginal common-class X-ray flare observed at 09/1249UTC from the largest and most complex sunspot region on the sun in the northeast. This group showed development in its intermediate spots and overall growth, and was one of up to six sunspot regions on the sun at present.

The other main area of development was in the southwest, with an apparent latent 'upwelling' resulting in growth of two sunspot regions here. These groups eventually developed magnetic bipolarity, but with no associated X-ray activity. The remainder of the front-sided sunspot regions were inactive, stable or in decay in the period.

There remain numerous - mostly small - 'filaments' (arcs of plasma) on the sun at present. The largest of these lifted off the southeastern solar horizon late in the UTC evening of 09 March, with the resultant Coronal Mass Ejection (CME) clearly discernible in imagery s into the current UTC day. This event has been modelled, and counter to expectations does in fact show marginal influence is possible at Earth from at least the shock at the very end of the four-day period. This is therefore now one of up to three CMEs in the forecast.

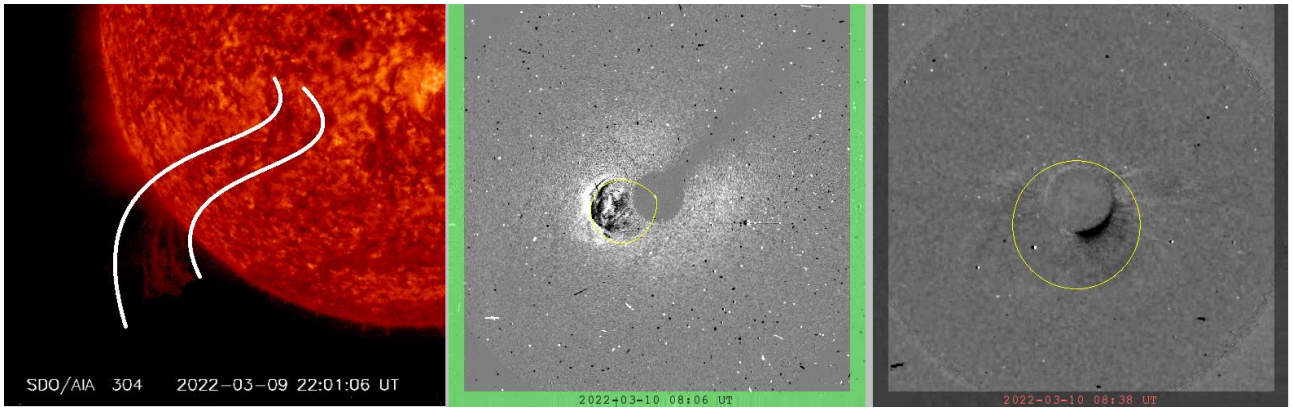

Figure 1: Left: False-colour extreme UV image of late UTC evening southeastern 'filament lift-off', marked in white. Also shown are running difference satellite images of the ensuing CME from a perspective on the Sun-Earth line (centre) and slightly to the east (right, from the satellite STEREO A). Counter to expectations, this CME does potentially bear an Earth-bound component, although the chances of Minor Geomagnetic Storm G1 are considered very small.

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Solar Wind / Geomagnetic Activity: The solar wind was reflective of a slow regime, perhaps with the last vestiges of the recent coronal hole fast wind apparent right at the start of the 24 hours. The solar wind speed accordingly fell, soon reaching background levels. The number of particles comprising the wind conversely showed a slight rising trend, although remaining well within normal levels throughout. The associated magnetic field was small-scale and level, however the north-south component spent protracted amounts of time anti-aligned with Earth's field.

The net result of the above solar wind measures was nevertheless provisionally quiet through the 24 hours.

Energetic Particles / Solar Radiation: No solar radiation storms were observed.

Four-Day Space Weather Forecast Summary

Solar Activity: Solar activity is expected to be low, with further common-class flares, but with a daily chance of rising to moderate-class - the main risk being from the complex northeastern sunspot region.

Solar Wind / Geomagnetic Activity: No 'coronal hole' fast winds feature in this forecast period. There are now up to three CMEs en-route with a potentially Earth-directed component, all with low confidence. The first is from an uncertain source on 05 March; the second from a 'filament eruption' late on 06 March; and the third the aforementioned 09 March filament lift off. Any arrival(s) that occur are currently expected over the remainder of day one (Thursday 10 March) with ongoing influence possible during Friday; with a lull then likely ahead of a similar low confidence arrival late on Sunday 13 March.

In the absence of the CMEs, solar winds are expected to persist at background levels throughout the four-day period. There is a chance of G1/Minor Storm intervals with any CME arrival(s), as stated most likely occurring to end the working week, and perhaps again to round out the weekend.

Energetic Particles / Solar Radiation: No solar radiation storms are expected, but the westward advance of the current cohort of spots should result in a very slightly above-background risk of rising towards the S1 level.

Geomagnetic Storms:

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	30	30	5	10
Strong	G3	No	1	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

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Radio Blackouts - X Ray Flares:

X Ray Flares / Probability	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	R1-R2 M Class	No	25	25	25	25
Very Active	R3 to R5 X	No	2	2	2	2

Solar Radiation Storms - (High Energy Protons):

Radiation Storms / Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	≥ S1	No	2	2	2	2
Very Active	≥ S3 *	No	1	1	1	1
* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)						

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